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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
DHINGRA, RAKESH KUMAR	
ART UNIT	PAPER NUMBER
1763	

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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/716,729	BRCKA, JOZEF	
	Examiner	Art Unit	
	Rakesh K. Dhingra	1763	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *03* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *03 March 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-25* is/are pending in the application.

4a) Of the above claim(s) *21-25* is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

Applicant's election without traverse of invention of group I (claims 1-20) in the reply filed on 3/3/06 is acknowledged. Claim 21-25 are withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention.

Specification

The disclosure is objected to because of the following informalities:

Paragraph 0055, line 13 – shield 53 may be replaced with "shield 53" as shown in with Figure 7.

Appropriate correction is required.

Response to Arguments

Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection as explained hereunder.

Applicant has amended independent claims 1, 18 and dependent claims 16, 17, 20, 21.

Reference by Tanaka et al (US Patent No. 6,210,539) when combined with Moslehi et al and Usai reads on amended claim 1 limitations. Accordingly claim 1 and dependent claims 2-5, 8-10, 13, 14 have been rejected under 35 USC103 (a) as explained below.

Further claim 18 and dependent claims 19, 20 have been rejected under 35 USC 103 (a) as explained below.

Remaining dependent claims 6, 7, 11 have also been rejected under 35 USC 103 (a) as explained below.

Additionally claims 1, 15-20 have also been rejected for double patenting as explained below.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

Claims 1-5, 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moslehi et al (US patent No. 6,471,830) in view of Tanaka et al (US Patent No. 6,210,539) and Usui (US patent No. 5,513,765).

Regarding Claims 1, 8: Moslehi et al teach an inductive plasma apparatus (Figures 4, 6) for a semiconductor wafer processing comprising:

an RF generator 126;

a matching network 128;

a substrate support (chuck) 140 lying in a plane;

an ionization source (coil segment) 116 coupled to the substrate support (Column 6, line 65 to Column 10, line 8).

Moslehi et al teach ionization source (coil) surrounding the substrate support, but do not teach the coil surrounding the substrate support in the plane and mounted on the periphery of the substrate support and the substrate support and ionization source (coil) coupled in a series RF circuit and a substrate support capacitively coupled to plasma.

Tanaka et al teach a plasma apparatus (Figures 1, 3) that includes a plasma chamber 1 with pedestal 6 that has a substrate support portion 7 on which a substrate 8 is supported. Tanaka et al further teach that the apparatus further includes a coil 20 for generating plasma in the chamber that surrounds and is mounted on the periphery of

the substrate support 6. Tanaka et al also teach that coil 20 is movable in up/down direction with the help of piston cylinder assembly 30 over a range that is below the plane of substrate support to a plane above that of the substrate support 6 (column 3, line 15 to column 4, line 30).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a coil that surrounds the substrate support in the plane (by up/down movement of coil) as taught by Tanaka et al in the apparatus of Moslehi et al to provide uniform plasma potential and density parallel to surface of substrate (column 2, lines 20-40).

Moslehi et al in view of Tanaka et al do not teach substrate support and ionization source (coil) coupled in a series RF circuit and a substrate support capacitively coupled to plasma.

Usai teaches an inductive plasma apparatus (Figures 1-4) that includes a vacuum chamber 1 with inductive plasma coil 2 and parallel electrodes 3, 4 such that both capacitive and inductive plasma are generated within the vacuum chamber. Usai further teaches that the inductive coil 2, substrate support (electrode) 3 are coupled in series (Figure 4) and supplied RF power from power supply 6 through matching circuit 5 (Column 3, line 30 to Column 4, line 15).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a series RF circuit configuration for substrate support and the ionization source (coil) as taught by Usai in the apparatus of Moslehi et al in view of Tanaka et al to obtain plasma with high density and uniformity for large substrates (Column 2, lines 10 – 30).

Regarding Claim 2: Moslehi et al teach that the ionization source is a coil (inductive element) 116 and have metallic shield 152 (Faraday) with slots 500 (Figures 10A, 10B) for coupling with plasma (Column 8, lines 10-45) and to reduce capacitive coupling.

Regarding Claim 3: Tanaka et al teach that annular coil 20 surrounds the substrate 8 and its position with respect to substrate support can be adjusted by up/down actuation mechanism (Column 4, lines 5-10).

Regarding Claim 4: Moslehi et al in view of Tanaka et al and Usai teach all limitations of the claim as explained above.

Regarding Claim 5: Moslehi et al teach all limitations of the claim including that matching network 128 (Moslehi et al – Figures 8A, 8B) is connected to an output of RF generator 126 and the peripheral ionization source (Coil) 116 is capacitively connected at one end thereof to the matching network (through capacitor 160) and is capacitively-coupled to the substrate support surface 140 (Moslehi – Column 9, line 55 to Column 10, line 65).

Regarding Claim 9: Moslehi et al teach that the peripheral ionization source (coil) 116 is capacitively-coupled (inherently) to the substrate support surface 140; and
the matching network 128 has impedances (variable capacitors) 160 in series with the peripheral ionization source (coil) 116 that are approximately tuned to the frequency of the RF generator 126 (Column 10,lines 45-65).

Regarding Claim 10: Moslehi et al teach that coil 116 is configured to inductively couple RF energy into plasma and it forms a high density plasma that can be configured as required by adjustable height of the coil 116 with respect to substrate 138 and by using desired shape of the coil (Column 7, lines 15-50 and Column 10, lines 1-7).

Claim 6 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moslehi et al (US patent No. 6,471,830) in view of Tanaka et al (US Patent No. 6,210,539) and Usui (US Patent No. 5,513,765) as applied to claim 1 and further in view of Denda et al (US Patent No. 6,440,260).

Regarding Claim 6: Moslehi et al in view of Tanaka et al and Usai teach all limitations of the claim including that coil 116 is capacitively coupled to substrate support as explained above and is capacitively coupled to chamber ground through capacitor 162 (Figure 8A).

Moslehi et al in view of tanaka et al and Usai do not teach matching network is capacitively coupled to substrate support surface.

Denda et al teach an apparatus (Figure 1) that includes a reaction chamber 18 with substrate support 22 connected to RF power source 28 via a matching network 30 through blocking capacitor 32 (Column 4, lines 20-45).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to connect matching network to substrate support by capacitive coupling (using a blocking capacitor) as taught by Denda et al in the apparatus of Moslehi et al in view of Tanaka et al and Usai to smooth the power applied to the substrate support.

Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moslehi et al (US Patent No. 6,471,830) in view of Tanaka et al (US Patent No. 6,210,539) and Usui (US patent No. 5,513,765) as applied to claim 1 and further in view of Dible et al (US Patent No. 6,042,686).

Regarding Claim 7: Moslehi et al in view of Tanaka et al and Usai teach all limitations of the claim except that the substrate support is an electrostatic chuck.

Dible et al teach an apparatus (Figure 1(a) that includes a substrate support 2 with electrostatic clamping system and connected to RF power source 16 through a capacitor Cd (Column 4, line 45 to Column 5, line 30).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use an electrostatic chuck to support the substrate support as taught by Dible et al in the apparatus of Moslehi et al in view of Tanaka et al and Usai to enable proper wafer clamping and uniform processing from center to edge of wafer (Column 5, lines 5-12).

Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over Moslehi et al (US patent No. 6,471,830) in view of Tanaka et al (US Patent No. 6,210,539) and Usui (US Patent No. 5,513,765) as applied to claim 1 and further in view of Liu et al (US PG Pub. No. 2002/0027205).

Regarding Claim 11: Moslehi et al in view of Tanaka et al and Usai teach all limitations of the claim as explained above including that matching network 128 has an input end and an output end and that it comprises of inductor [Figures 8A, 8B, Column 7, lines 40-43 and Column 11, lines 10-25].

Moslehi et al in view of Tanaka et al and Usai do not teach that the matching network includes an inductor connected in series and is connected to the (coil) ionization source in series.

Liu et al teach an apparatus (Figure 7) that includes a matching network 50 that has an inductor 125 connected in series between input and output ends and the inductor 125 is connected in series with antenna (coils) 46 (Paragraph 0014).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use matching network with inductor and connected to ionization source in series as taught by Liu et al in the apparatus of Moslehi et al in view of Tanaka et al and Usai to minimize reflective power and provide proper coupling current to the coil.

Claims 12, 15-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moslehi et al (US patent No. 6,471,830) in view of Tanaka et al (US Patent No. 6,210,539) and Usui (US Patent No. 5,513,765) as applied to claim 1 and further in view of Pu et al (US Patent No. 6,825,618).

Regarding Claim 12: Moslehi et al in view of Tanaka et al and Usai teach all limitations of the claim as explained above including that matching network 128 has an input end and an output end and that it comprises of inductor [Figures 8A, 8B, Column 7, lines 40-43 and Column 11, lines 10-25].

Moslehi et al in view of Usai do not teach that the matching network includes an inductor connected in series and is connected to the (coil) ionization source in parallel.

Pu et al teach an apparatus (Figure 8) that includes a matching network 31 that has an inductor 93 connected in series between input and output ends and the inductor 93 is connected in series with ionization source (coils 40, 42) [Column 12, lines 25-45].

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use matching network with inductor that is connected to ionization source in parallel as taught by Pu et al in the apparatus of Moslehi et al in view of Tanaka et al and Usai to minimize sputtering of chamber lid by ions from the plasma (Column 12, lines 47-55).

Regarding Claim 15: Moslehi et al in view of Usai and Pu et al teach (Pu et al - Figures 1-3, 9) an ionization source (coil) configuration that has alternating coil segments 40, 42 arranged in a ring positioned to couple power in an annular alternating low and high power distribution. Pu et al also teach that these coils can also be mounted inside the chamber (Figure 9, Column 13, lines 10-25 and Column 2, lines 45-50).

Regarding Claim 16: Pu et al teach that a Faraday shield can be mounted between induction coil array and chamber interior to reduce capacitive coupling (Pu et al – Column 12, lines 59-63). Further, Moslehi et al teach that apparatus also includes shield 153 (in a ring shape) that is a slotted shield (like segmented configuration). Moslehi et al also teach that shape and dimensions of the shield 153 and slots 500 can be optimized to maximize magnetic filed penetration from the coil segment 116 through shield 153 for ionization of process plasma (that is coupling of power through alternating high and low transparency sections in the alternating high and low power distribution (Moslehi et al – Column 12, lines 5-25).

In this connection courts have ruled (Case Law):

"It would have been obvious to one having ordinary skill in the art to have determined the optimum value of a cause effective variable through routine experimentation in the absence of a showing of criticality. *In re Woodruff*, 16 USPQ2d 1934, 1936 (Fed. Cir. 1990)."

Regarding Claim 17: Moslehi et la in view of Pu et al teach all limitations of the claim as explained above and also teach that the ionization source is an antenna and it is possible for antenna/coil to have segments in various configurations/shapes (including parallel to dielectric chamber wall 10) as required for process limitations. Further Moslehi et al also teach that shape and dimensions of shield and the slots can be optimized to match with the antenna configuration to minimize sputtering on the shield

(Moslehi et al – Column 7 line 15 to Column 8, line 12 and Column 12, lines 25-45 and Column 13, line 34 to Column 14, line 40 and Column 17, line 30 to Column 18, line 20; and Pu et al – Column 7, line 30 to Column 8, line 45 and Figure 9, Column 13, lines 10-25 and Column 16, lines 5-20).

Regarding Claims 18-20: Moslehi et al in view of Pu et al teach all limitations of the claims as explained above.

Claims 13, 14 are rejected under 35 U.S.C. 103(a) as being unpatentable over Moslehi et al (US patent No. 6,471,830) in view of Tanaka et al (US Patent No. 6,210,539) and Usui (US patent No. 5,513,765) as applied to Claim 1 and further in view of Hanawa (US Patent No. 6.027,601).

Regarding Claim 13: Moslehi et al in view of Tanaka et al and Usai teach all limitations of the claim as explained above except that peripheral ionization source (coil) is connected in the matching circuit in lieu of a separate inductor.

Hanawa teach an inductive plasma apparatus (Figures 1, 4) that includes a coil antenna 24 that provides matching between RF source 26 and the chamber (column 2, line 65 to column 3, line 15).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to peripheral ionization source instead of separate inductor for matching as taught by Hanawa in the apparatus of Moslehi et al in view of Tanaka et al and Usai to exploit the antenna itself for matching and avoid the matching circuit elements.

Regarding Claim 14: Moslehi et al in view of Usui teach all limitations of the claim as explained above and also that peripheral ionization source (coil) 116 includes individual inductive elements (coils) that are connected in series through mutual stray capacitance

since all the inductive elements of the coil are grounded (Moslehi et al - Figures 8A, 8B and Column 11, lines 1-10 and Usui- Figure 1).

Double Patenting

The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., In re Berg, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); In re Goodman, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); In re Longi, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); In re Van Ornum, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); In re Vogel, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and In re Thorington, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).
A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.
Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1, 15-20 are provisionally rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-8 of copending Application No. 10/717,268 in view of Moslehi et al (US Patent No. 6,471,830) in view of Tanaka et al (US Patent No. 6,210,539) and Usai (US Patent No. 5,513,765).

This is a provisional obviousness-type double patenting rejection.

Although the conflicting claims are not identical they are not patentably distinct from each other because particularly claims 15-20 of the present application are essentially the same as claims 1-3, 5, 6, 8 of the copending application except that the application under examination has additional limitations of a) RF generator, b) a series RF circuit that includes a substrate support surface lying in a plane and peripheral ionization

source coupled to and surrounding the substrate support in the plane and mounted on the periphery of the substrate support; c) a matching network coupling the RF generator into the series circuit; and d) the RF generator coupling RF energy to the series RF circuit to bias the substrate support surface to capacitively couple to a plasma proximate the substrate support surface and to energize the peripheral ionization source to inductively couple to the plasma.

Moslehi et al teach an inductive plasma apparatus (Figures 4, 6) for a semiconductor wafer processing comprising:

an RF generator 126;

a matching network 128;

a substrate support (chuck)140;

an ionization source (coil segment) 116 coupled to the substrate support in the chamber (Column 6, line 65 to Column 10, line 8).

Moslehi et al teach ionization source (coil) surrounding the substrate support, but do not teach the coil surrounding the substrate support in the plane and mounted on the periphery of the substrate support and the substrate support and ionization source (coil) coupled in a series RF circuit and a substrate support capacitively coupled to plasma.

Tanaka et al teach a plasma apparatus (Figures 1, 3) that includes a plasma chamber 1 with pedestal 6 that has a substrate support portion 7 on which a substrate 8 is supported. Tanaka et al further teach that the apparatus further includes a coil 20 for generating plasma in the chamber that surrounds and is mounted on the periphery of the substrate support 6. Tanaka et al also teach that coil 20 is movable in up/down direction with the help of piston cylinder assembly 30 over a range that is below the

plane of substrate support to plane above that of the substrate support 6 (column 3, line 15 to column 4, line 30).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use a coil that surrounds the substrate support in the plane (by up/down movement of coil) as taught by Tanaka et al in the apparatus of Moslehi et al to provide uniform plasma potential and density parallel to surface of substrate (column 2, lines 20-40).

Moslehi et al in view of Tanaka et al do not teach substrate support and ionization source (coil) coupled in a series RF circuit and a substrate support capacitively coupled to plasma.

Usai teaches a plasma apparatus (Figures 1-4) that includes a vacuum chamber 1 with inductive plasma coil 2 and parallel electrodes 3, 4 such that both capacitive and inductive plasma are generated within the vacuum chamber. Usai further teaches that the inductive coil 2, substrate support (electrode) 3 are coupled in series (Figure 4) and are being supplied RF power from power supply 6 through matching circuit 5 (Column 3, line 30 to Column 4, line 15).

Therefore it would have been obvious to one of ordinary skill in the art at the time of the invention to use an ionization source inside the process chamber and coupled with substrate support and connected in a series circuit configuration as taught by Usai in the apparatus as per claims 1-8 and as per Moslehi et al in view of Tanaka et al to obtain plasma with high density and uniformity for large substrates (Usai- Column 2, lines 10 – 30).

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rakesh K. Dhingra whose telephone number is (571)-272-5959. The examiner can normally be reached on 8:30 -6:00 (Monday - Friday). If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Parviz Hassanzadeh can be reached on (571)-272-1435. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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